REMARKS

Favorable reconsideration of the application is respectfully requested in light of the amendments and remarks herein.

Upon entry of this amendment, claims 1-2, 4-7, 9-12, and 14-21 will be pending. By this amendment, claims 1 and 14 have been amended; claims 18-21 have been added. No new matter has been added.

§ 103 Rejection of Claims 1-2, 4-5, 9, and 14

In Section 5 of the Office Action, claims 1-2, 4-5, 9, and 14 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Jiang et al. (U.S. Patent No 6,539,353; hereinafter referred to as "Jiang") in view of Ehsani et al. (U.S. Publication No. 2002/0128021; hereinafter referred to as "Ehsani"), and further in view of Kimura et al. (USPN 6,067,510; hereinafter referred to as "Kimura"). Claims 1 and 14 have been amended to clarify and to round out the scope of protection to which Applicant is entitled.

In the Background section of the Specification, it is stated that "[o]ne major drawback of conventional methods and devices for large vocabulary speech recognition is the large complexity and the large number of possible candidates of speech fragments or elements to be searched for and to be tested. Without limiting the scope of subject-matter and therefore the scope of vocabulary, all possible candidates for speech elements or speech fragments have to be evaluated by distinct searching techniques." *Background of the Specification, page 3, lines 1-6.*

To address the above-described drawback of the conventional large vocabulary speech recognition, embodiments of the present invention provide methods and apparatus for

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recognizing speech in a more efficient manner. For example, the steps of method claim 1, as

presented herein, include:

"(a) *receiving* a speech phrase;

(b) *generating* a signal being representative to said speech phrase;

(c) *pre-processing and storing* said signal with respect to a determined set of rules;

(d) *generating* from said pre-processed signal at least one series of hypothesis speech elements;

(e) *determining* at least one series of words being most probable to correspond to said speech phrase by applying a predefined language model to said at least one series of hypothesis speech elements,

wherein determining said at least one series of words further comprises:

(1) *determining* at least one sub-word, word, or a combination of words most probably being contained as a seed sub-phrase in said received speech phrase,

wherein said seed sub-phrase is recognized with an appropriate high degree of reliability, such that segments of speech which are recognized with high reliability are used to constrain the search in other areas of the speech signal where the language model employed cannot adequately restrict the search; and

(2) *continuing determining* words or combinations of words, which are consistent with said seed sub-phrase as at least a first successive sub-phrase which is contained in said received speech phrase, by inserting additional, paired and/or higher order information, including semantic and/or pragmatic information, between the sub-phrases, thereby decreasing the burden of searching,

wherein said semantic information includes description of said sub-phrases and said pragmatic information includes connecting information connecting said sub-phrases to actual situation, application, and/or action, and

wherein the predefined language model contains a low-perplexity recognition grammar obtained from a conventional recognition grammar by:

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(3) *identifying and extracting* word classes of high-perplexity from the conventional grammar;

(4) *generating* a phonetic, phonemic and/or syllabic description of the high-perplexity word classes, in particular by applying a sub-word-unit grammar compiler to them, to produce a sub-word-unit grammar for each high-perplexity word class; and

(5) *merging* the sub-word-unit grammars with the remaining low-perplexity part of the conventional grammar to yield said low-perplexity recognition grammar."

(emphasis added)

Accordingly, in one embodiment of claim 1, the speech recognition method includes determining at least one sub-word, word, or a combination of words most probably being contained as a seed sub-phrase in said received speech phrase, *wherein* said seed sub-phrase is recognized with an appropriate high degree of reliability, such that segments of speech which are recognized with high reliability are used to constrain the search in other areas of the speech signal where the language model employed cannot adequately restrict the search. *Specification, page 3, line 37 to page 4, line 1; page 4, lines 15-17; page 5, lines 28-37 (emphasis added).*

By contrast, although the Office Action states that Jiang teaches identifying a hypothesis string consisting of sub-word units, none of the cited passages of Jiang teach or suggest determining at least one sub-word, word, or a combination of words most probably being contained as a seed sub-phrase in said received speech phrase, *wherein* said seed sub-phrase is recognized with an appropriate high degree of reliability, such that segments of speech which are recognized with high reliability are used to constrain the search in other areas of the speech signal where the language model employed cannot adequately restrict the search. Jiang merely states that "[a] hypothesis word string that consists of sub-word units is identified from the extracted feature. For each identified word, a word confidence measure is determined based on

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weighted confidence measure scores for each sub-word unit in the word." Thus, Jiang only

teaches identifying a hypothesis word string and determining weighted confidence measure

scores for each sub-word unit in the hypothesis word string. None of the other cited passages of

Jiang disclose determining at least one sub-word, word, or a combination of words most

probably being contained as a seed sub-phrase in said received speech phrase, wherein said seed

sub-phrase is recognized with an appropriate high degree of reliability, such that segments of

speech which are recognized with high reliability are used to constrain the search in other areas

of the speech signal where the language model employed cannot adequately restrict the search.

Ehsani was cited for disclosing a phrase-based dialogue modeling method for producing

low-perplexity recognition grammar having semantic information including a description

between sub-phrases. Kimura was cited for teaching inserting additional, higher order

information (hierarchy), including semantic (semantic features), between the sub-phrases,

thereby decreasing the burden of searching, wherein the semantic information includes

description of the sub-phrases. Therefore, Jiang, Ehsani, and Kimura, individually or in

combination, fail to teach or suggest determining at least one sub-word, word, or a combination

of words most probably being contained as a seed sub-phrase in said received speech phrase,

wherein said seed sub-phrase is recognized with an appropriate high degree of reliability, such

that segments of speech which are recognized with high reliability are used to constrain the

search in other areas of the speech signal where the language model employed cannot adequately

restrict the search.

Based on the foregoing discussion, it is maintained that claim 1 should be allowable over

Jiang, Ehsani, and Kimura. Since claim 14 closely parallels, and recites substantially similar

limitations as recited in, claim 1, claim 14 should also be allowable over Jiang, Ehsani, and

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Kimura. Further, since claims 2, 4-5, and 9 depend from claim 1, claims 2, 4-5, and 9 should also be allowable over Jiang, Ehsani, and Kimura.

Accordingly, it is submitted that the rejection of claims 1-2, 4-5, 9, and 14 based upon 35 U.S.C. §103(a) has been overcome by the present remarks and withdrawal thereof is respectfully requested.

§ 103 Rejection of Claims 15-17

In Section 5 of the Office Action, claims 15 to 17 appear to stand rejected under 35 U.S.C. §103(a) as being unpatentable over Jiang in view of Ehsani. The basis of rejection under U.S.C. §103(a) is not clearly set forth, but Jiang and Ehsani are cited as rendering obvious claims 15-17.

Based on the foregoing discussion regarding claim 14, and since claims 15-17 depend from claim 14, claims 15-17 should be allowable over Jiang and Ehsani.

§ 103 Rejection of Claims 6-7 and 10-12

In Section 6 of the Office Action, claims 6-7 and 10-12 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Jiang in view of Ehsani and Kimura, in further view of Chou et al. (U.S. Patent No. 5,797,123; hereinafter referred to as "Chou").

Based on the foregoing discussion regarding claim 1, and since claims 6-7 and 10-12 depend from claim 1, claims 6-7 and 10-12 should be allowable over Jiang, Ehsani and Kimura. Chou was merely cited for teaching "limited vocabulary word spotting (low perplexity) with a parallel network of subword models used to model the non-keyword portions of the input utterance (high-perplexity)"; for teaching "the insertion of functional words and filler phrases

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into the detection network to improve recognition of key-phrases"; and for teaching "the merging of the states of the key-phrase network." Therefore, Jiang, Ehsani, and Chou, individually or in combination, fail to teach or suggest determining at least one sub-word, word, or a combination of words most probably being contained as a seed sub-phrase in said received speech phrase, *wherein* said seed sub-phrase is recognized with an appropriate high degree of reliability, such that segments of speech which are recognized with high reliability are used to constrain the search in other areas of the speech signal where the language model employed cannot adequately restrict the search.

Accordingly, it is submitted that the rejection of claims 6-7 and 10-12 based upon 35 U.S.C. §103(a) has been overcome by the present remarks and withdrawal thereof is respectfully requested.

Newly-added claims 18-21

Newly-added claims 18-21 clarify and round out the scope of protection to which Applicant is entitled. For example, claim 18 recites:

> "The method of claim 1, wherein said sub-seed phase recognized with an appropriate high degree of reliability is defined as a low perplexity part of said received speech phrase."

See Specification, page 3, line 37- page 4, line 1; page 5, lines 33-35.

Claim 19 recites:

> "The method of claim 18, wherein perplexity is defined as the complexity of the depth of search which has to be accomplished in conventional search graphs or search trees."

See Specification, page 5, lines 24-26.

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It is submitted that the newly-added limitations recited in claims 18-21 are not disclosed by the cited prior art references. Further, based on the foregoing discussion regarding claim 1, and since claims 18-19 depend from claim 1, claims 18-19 should be allowable over the cited prior art references. Based on the foregoing discussion regarding claim 14, and since claims 20 and 21 depend from claim 14, claims 20-21 should also be allowable over the cited prior art references.

Conclusion

In view of the foregoing, entry of this amendment, and the allowance of this application with claims 1-2, 4-7, 9-12, and 14-21 are respectfully solicited.

In regard to the claims amended herein and throughout the prosecution of this application, it is submitted that these claims, as originally presented, are patentably distinct over the prior art of record, and that these claims were in full compliance with the requirements of 35 U.S.C. §112. Changes that have been made to these claims were not made for the purpose of patentability within the meaning of 35 U.S.C. §§101, 102, 103 or 112. Rather, these changes were made simply for clarification and to round out the scope of protection to which Applicant is entitled.

In the event that additional cooperation in this case may be helpful to complete its prosecution, the Examiner is cordially invited to contact Applicant's representative at the telephone number written below.
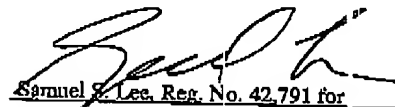
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The Commissioner is hereby authorized to charge any insufficient fees or credit any

overpayment associated with the above-identified application to Deposit Account 50-0320.

Respectfully submitted,

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